higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

T1290**(E)**(A5)T

NATIONAL CERTIFICATE

PLANT OPERATION THEORY N1

(11040001)

5 April 2018 (X-Paper)
09:00–12:00

This question paper consists of 4 pages and 1 formula sheet.

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DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE
PLANT OPERATION THEORY N1
TIME: 3 HOURS
MARKS: 100

INSTRUCTIONS AND INFORMATION

1. Answer ALL the questions.
2. Read ALL the questions carefully.
3. Number the answers according to the numbering system used in this question paper.
4. Sketches must be large, neat and fully labelled.
5. Write neatly and legibly.

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QUESTION 1: CHEMISTRY

1.1 Complete the table below by writing the missing information next to the question number (1.1.1–1.1.10) in the ANSWER BOOK.

COMPOUND NAMES	CHEMICAL NAMES	CHEMICAL FORMULA
Table salt	1.1.1	1.1.2
Water	1.1.3	1.1.4
Quicklime	1.1.5	1.1.6
Alumina	1.1.7	1.1.8
Sand	1.1.9	1.1.10

(10 × 1) (10)

1.2 Give the electron configuration of Aluminium and Oxygen. Explain which of the two structures complies with a noble gas structure. (5)

1.3 Write and balance the reaction of the following word equation:

Reaction when a zinc metal reacts with hydrogen gas and liberates an aqueous salt formation. (3)

1.4 Draw the structure of isobutylene. (4)

[22]

QUESTION 2: VALVES AND PIPES

2.1 Name the factors that affect the resistance of the flow through a pipe. (5)

2.2 Name FIVE advantages of plastic pipes. (5)

2.3 Make a sketch of a safety valve and clearly label each part. (6)

2.4 State FIVE precautions that are good practices for ensuring a long work life on valves. (5)

[21]

QUESTION 3: PUMPS AND INSTRUMENTATION

3.1 Name FIVE parts of centrifugal pumps and state where they are found. (10)

3.2 Name FIVE disadvantages of a vane valve. (5)

3.3 Show, by means of a sketch, the operation of a vane pump. (6)

[21]

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QUESTION 4: DISTILLATION AND WATER TREATMENT

4.1 List FOUR substances that cause water to harden. (4)

4.2 Give FIVE reasons why water from an industry needs to be purified. (5)

4.3 Define each of the following terms:

4.3.1 Distillation (3)

4.3.2 Evaporation (2)

4.3.3 Condensation (2)

4.4 Make a sketch of the vapour pressure piloted against the composition of liquid. (4)

[20]

QUESTION 5: SAFETY AND STORAGE

5.1 List FOUR items of personal protective equipment. (4)

5.2 List FOUR types of fire extinguishers to use when working with a class A fire. (4)

5.3 Name the different shapes into which fixed roof tanks are made. (5)

5.4 Give THREE reasons why steel roofs are mostly used on tanks around the world. (3)

[16]

TOTAL: 100

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FORMULA SHEET

Any applicable formula may be used.

1. $\rho = \frac{p}{gh}$
2. $V = \ell bh$
3. $V = \pi \frac{d^3}{6}$
4. $V = 4\pi \frac{r^3}{3}$
5. $V = x\left(\frac{\pi d^2 h}{12} + V_1\right)$
6. $\Delta P = \rho gh$
7. $V = \pi \frac{d^2}{4} \times h$
8. $\rho = \frac{F}{A}$
9. $A = \pi d^2$
10. $A = \pi \frac{d^2}{4} = \pi r^2$
11. $A = 4\pi r^2$
12. $R = \frac{output}{input} \times 100\%$
13. $\rho_1 gh = \rho_2 gh$
14. $Q = Av = C$
15. $k = \frac{Q}{\sqrt{h}}$
16. $E = \frac{mv^2}{2}$
17. $E = mgh$
18. $V = \pi DN$
19. $V = \frac{a}{t}$
20. $V = \sqrt{2gh}$
21. $PA = mg$
22. $h_{su} = m\{(h_f + gh_{fg}) + C_s(t_{su} - t_s) - (C_w \times t_w)\}$
23. $m = \rho v$
24. $A = \frac{F}{p}$
25. $K = \frac{mv^2}{2}$
26. $K = W/m^2K$
27. $Pv = cT$
28. $m = \frac{Pv}{RT}$
29. $n = \frac{Pv}{R_0 T}$
30. $V = A\ell NnR$
31. $K = \frac{Qx}{A\Delta t}$

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